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DEFINING THE FUTURE

LCROSS: A Unique Spacecraft For A Unique Mission

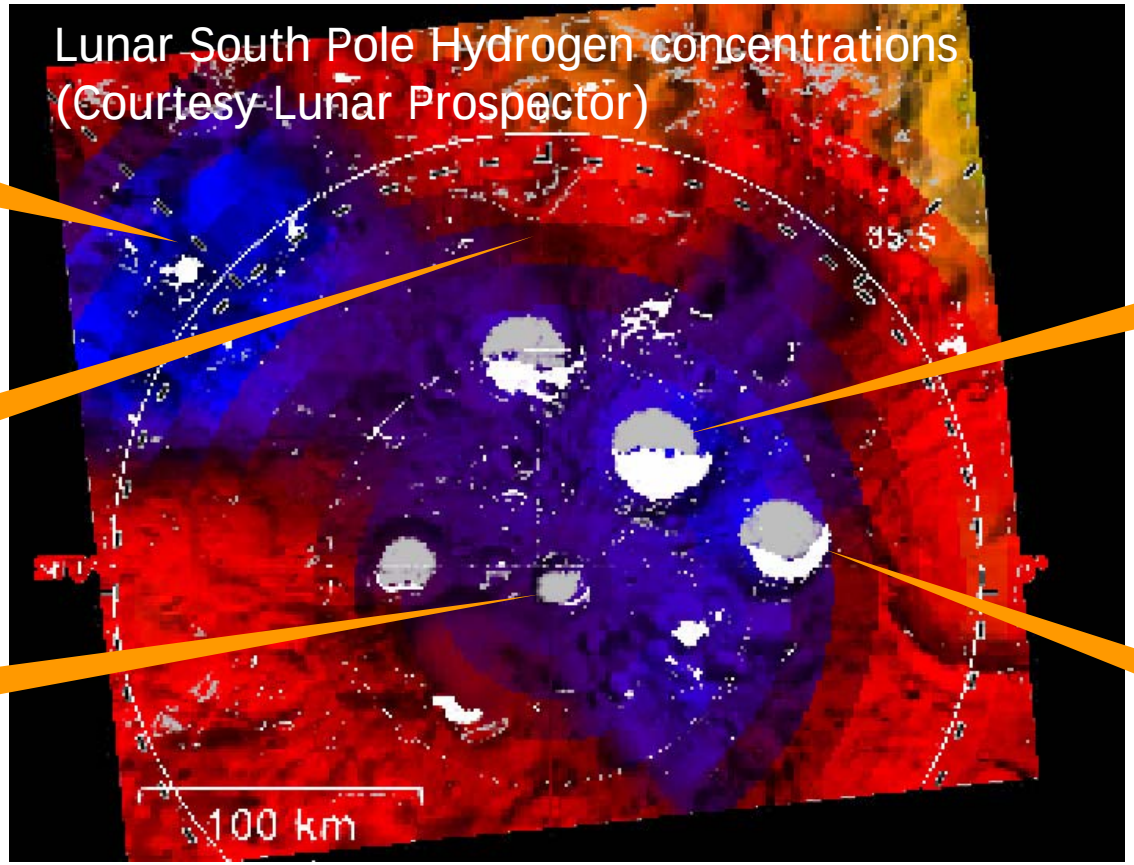
2008 CubeSat Workshop
April 11, 2008

Craig Elder

LCROSS Spacecraft Lead EE
& Deputy Project Manager

“The Question...”

- Does Water Ice exists at the bottom of very deep, permanently-shadowed craters at the Moon’s poles?



The Means to “The Answer” is LCROSS

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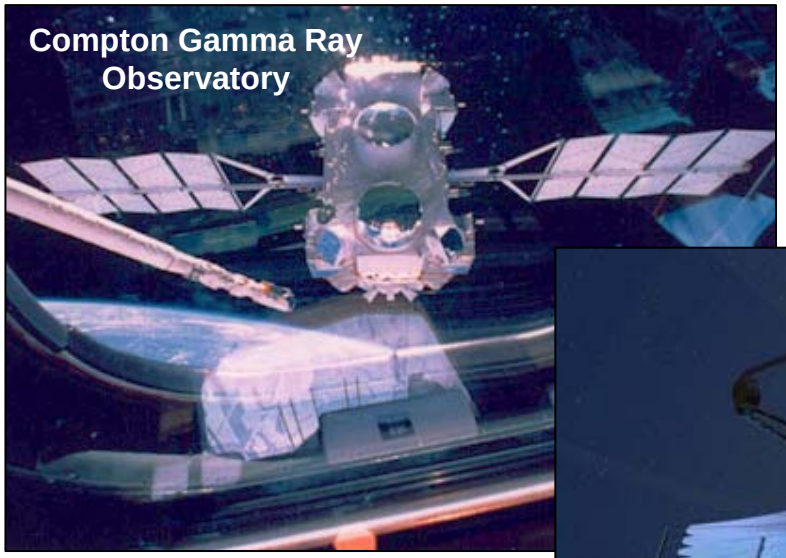
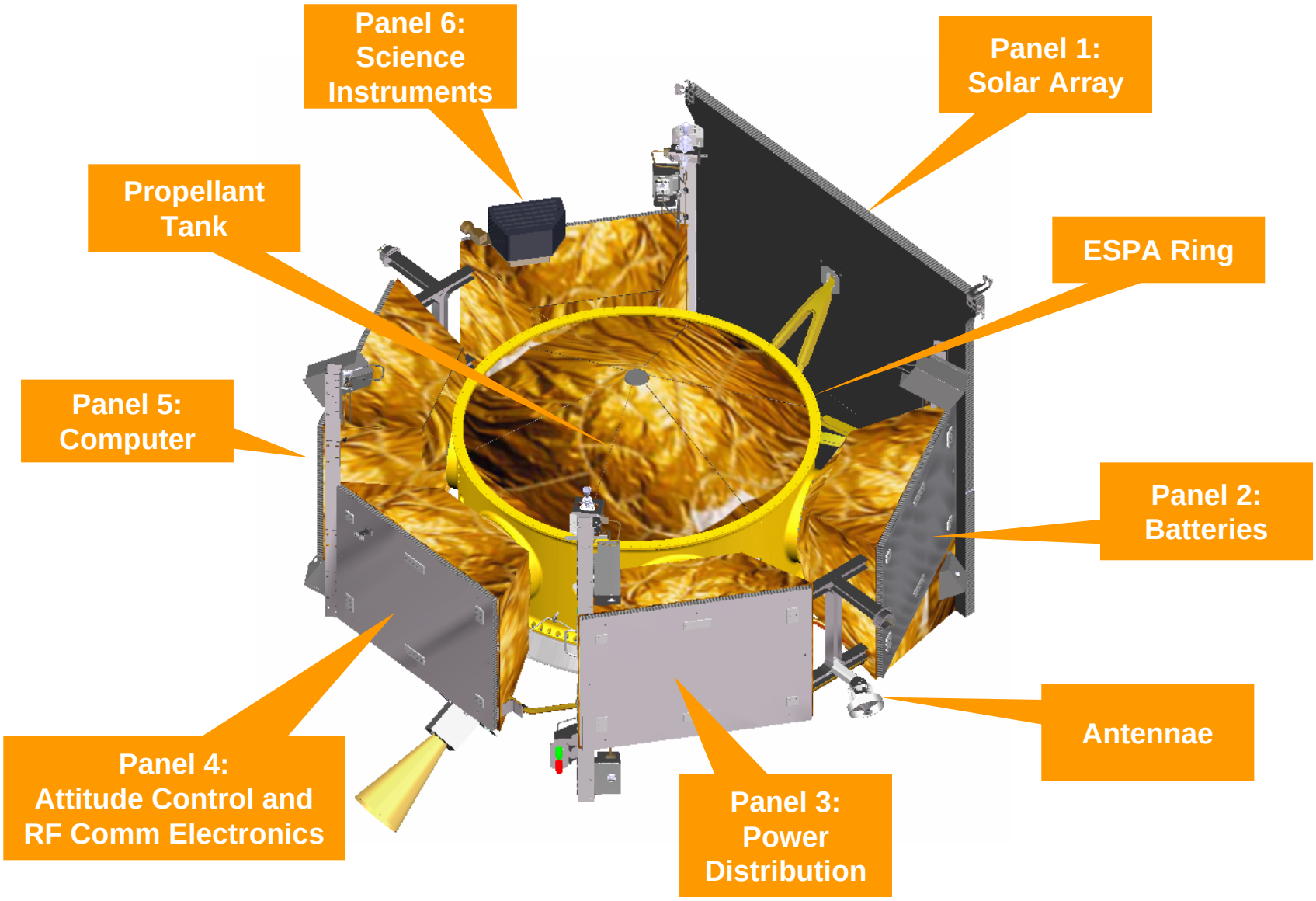
- The Concept: Drive a spent upper stage rocket into the bottom of one of these craters to kick up as much regolith as possible.
- The Bonus: If conditions are right, LCROSS will separate from the Centaur, perform a braking burn, analyze the Centaur impact, then impact in a nearby location to create a second observable plume.
- [link to LCROSS Mission video]

LCROSS was Different than Usual Approach

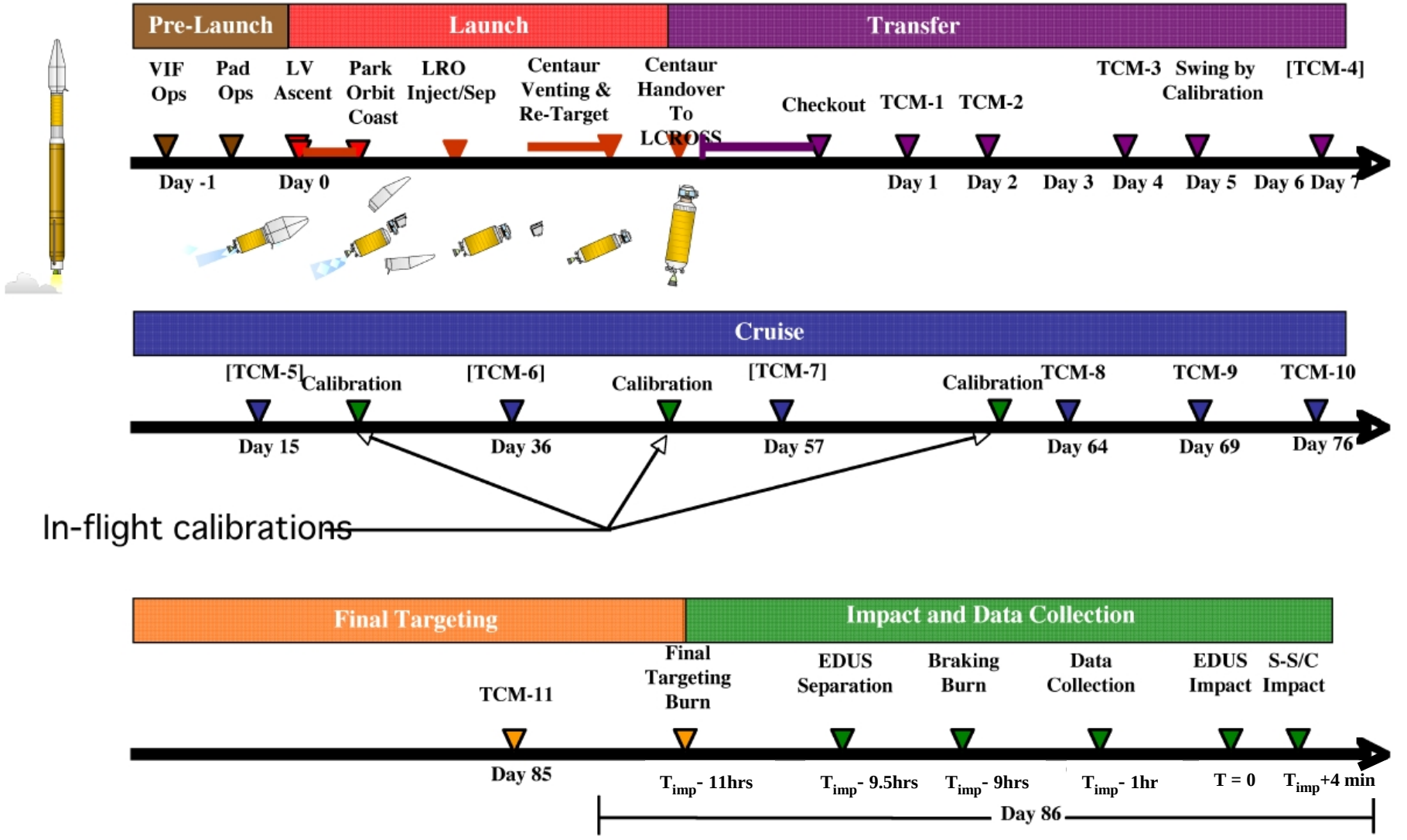
- Northrop is used to building large, complex scientific and military spacecraft
- But LCROSS needed to be
  - **VERY** low-cost
  - Developed on a **VERY** short schedule



The Result: The LCROSS Spacecraft



Nominal Mission Timeline



Unique Design Challenges

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- Technical: LCROSS had to support the weight of LRO during launch, plus support it's electrical and mechanical interfaces.
  - LCROSS made extensive use of ESPA ring structure's capabilities
  - Timely data exchanges with LRO, Launch Vehicle, & Launch Site Teams
- Cost: As a Class-D mission, LCROSS had to keep total mission cost under $79M fiscal limit.
  - Extensive re-use of designs reduced Non-Recurring Engineering costs
  - Small team of focused experts reduced documentation costs
- Schedule: LCROSS would only be allowed to use LRO's Centaur if we could meet the 2008 LRO launch date
  - Designs could only use available parts
  - Tests had to be tailored or deleted
  - Risk Management used extensively in trades, implementation

EELV Secondary Payload Adapter (ESPA) Ring is mounted to Propulsion Tank Support

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Integrating Electronics onto Panels

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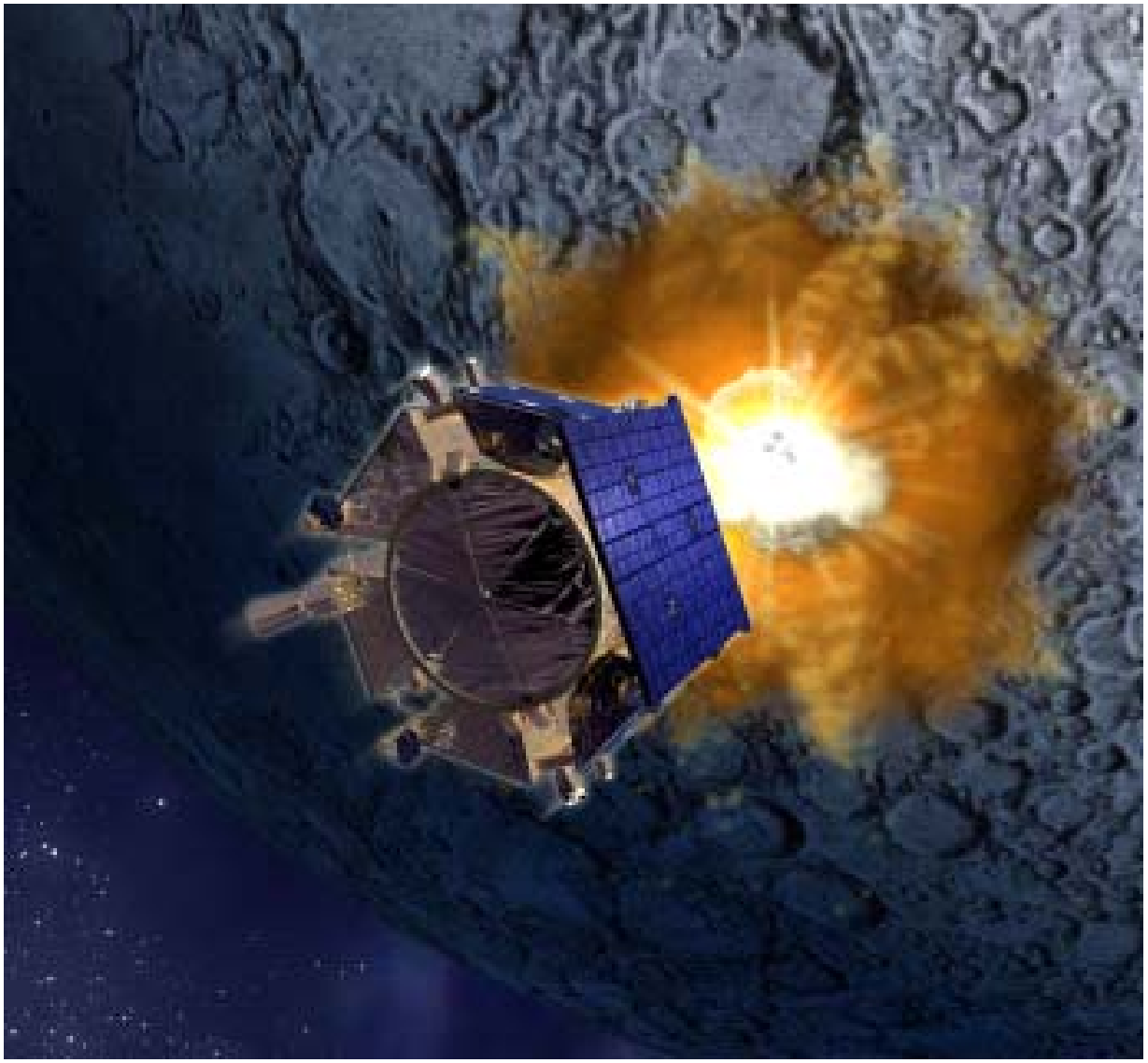
Next Stop...the Moon!



Appendix

Abstract “LCROSS: A Unique Spacecraft”

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- It isn’t often that a designer gets to add weight to a spacecraft, but when your mission is to kinetically dislodge as many tons of lunar regolith as possible, a unique design results. The Northrop-NASA Lunar CRater Observation and Sensing Satellite (LCROSS) team took advantage of weight margin and mission trajectory to simplify the spacecraft design (add extra power sources, eliminate costly deployables, re-use heritage spacecraft components). These simplifications allowed LCROSS to meet the 2008 launch date AND keep total mission cost under the $79M fiscal limit.